which resembled this in color—different shades of it—lighter and darker than the one to be selected to. Care was taken by the operator not to call the name of the color. The student was not asked to select different shades of green, but to select yarns with a shade of "that color." The reason for this is plain. It is true that one-half the color-blind students had another name for the color than green, and they might be needlessly alarmed if they were to discover their catalogue of colors differed from that of the operator. If the person being tested selected as many as a dozen different shades from the colors of confusion, with no hesitation and no mistakes, he was dismissed and regarded as normal in color-sight. If, however, there was an evident uncertainty, a hesitation, an apparent lack of confidence in his judgment, he was given a further trial, even though no mistakes were made. If the person tested selected one or more colors to match the green with no shade of green in them, a further test was given on other colors. This further test is for the purpose of determining on what particular colors the eyesight is deficient, for it is seldom that color-blindness extends so far as to render the subject totally color-blind—although a few such cases have been met with.

The results are given by classes, as that seemed the most natural classification that could be made.

The class of '88 contained 26 members, two of whom were incompletely color-blind. They both confused the brown yarns with the green. I give the colors one selected to match the green: Green 16, brown 7, orange 1.

The class of '89 contained 47 members, all of normal sight.

The class of '90 contained 78 members, two of whom were completely color-blind. One of them selected green 3, red 6, pink 3 to match the green; the other, green 8, red 3, brown 2.

One of these, the first one, called the green and red and pink, shades of green. He was red-blind; knew no such color as red. The other called them red. He was green-blind.

The class of '91 contained 185 members. Four were completely color-blind, and four incompletely color-blind. Of the completely color-blind, two were red- and two were green-blind. Two were brothers, one red- and one green-blind. A sister and several cousins were all normal. Of the incompletely color-blind, three confused blue and green and one brown and green.

The class of '92 contained 208 members. One was completely color-blind—red-blind—and three were incompletely color-blind, all confusing blue with the green.

SUMMARY.

Total number examined, 544.
Total number completely color-blind, 7.
Total number incompletely color-blind, 9.
Per cent. deficient, 3—.
Per cent. completely color-blind, 1.3—.

A COMPARISON OF THE RECORDS OF THE TWO ANEMOMETERS AT THE UNIVERSITY OF KANSAS.

BY PROF. F. H. SNOW, OF THE UNIVERSITY.

Until the erection of an anemometer by Professor Lovewell at Washburn College, the only anemometers in the State of Kansas were those at the State University, at Lawrence, and at the Signal-Service station, in the city of Leavenworth. The

observer at the latter station, in the year 1876, noting the fact that the instrument at Lawrence recorded more than twice as much wind as the Leavenworth instrument, criticised the records of the University anemometer as palpably erroneous, fortifying the criticism by the statement that no other stations, except those on Pike's Peak, Colorado, Mt. Washington, New Hampshire, and other high mountain stations, could equal the records at Lawrence. In order to test the accuracy of our records, Mr. John H. Long, of the class of 1877 of the Kansas University, now the distinguished professor of chemistry in the Chicago Medical College, was induced to make a thorough investigation of the question. The results of this investigation are to be found in vol. VI of the Transactions of this Academy, pp. 87–89. Dr. Long established the following facts regarding the University anemometer: 1st, That it never registers too much; 2d, that for medium and high winds it makes a very close approximation to the actual velocity; and 3d, that for small velocities it does not register enough. This is due to the fact that a gentle breeze sufficient to give a positive direction to a column of smoke will sometimes fail to move the cups for many minutes. This instrument is after the English pattern, with cups nine inches in diameter on arms twenty-four inches in length, and is connected with the recording apparatus by a shaft whose upper and lower portions are of solid steel for a distance of three feet, while the intervening portion consists of twenty-five feet of three-fourths-inch gas pipe. The weight and friction of this shaft are sufficient cause for the failure of the cups to readily respond to winds of less than five miles an hour, and are also sufficient to more than overcome the twenty-per-cent. advantage which, according to the English Professor Stokes, is possessed by this large type of anemometer over the smaller instrument in use by the U. S. Signal Service, with cups four inches in diameter on arms only seven inches in length. By the courtesy of the Signal Service, I have had the use of one of these smaller anemometers during the past year. This instrument has the same exposure as the larger instrument, and has afforded another means of testing its accuracy. The following is a comparison of the records of the two anenometers from March 10th to October 1st, 1888:

Month.	*Larger Anemometer.*	*Smaller Anemometer.*
March	10,130 miles.	9,522 miles.
April	12,860 "	12,313 "
May	10,956 "	10,871 "
June	10,380 "	10,365 "
July	7,160 "	7,980 "
August	7,841 "	8,367 "
September	6,903 "	7,127 "
Total	66,230 miles.	66,545 miles.

From this tabular statement it appears that in March, April, May and June, in each of which months the total run of the wind exceeded 10,000 miles, the larger instrument recorded respectively 608, 547, 85, and 15 miles more wind than the smaller instrument; while in the calmer months of July, August and September the smaller instrument outran the larger by 820, 526, and 224 miles. For the entire period in which the comparison is made, the total register of the larger anemometer was 66,-230 miles, and that of the smaller was 66,545 miles—giving a difference of only 315 miles in the total results. During the seven months included in this comparison, occurred the highest wind ever recorded at Lawrence. Undoubtedly higher winds have swept across the station; but such winds have disabled the apparatus, and prevented a record. The greatest velocity ever recorded was on August 12th, 1888, in the five minutes from 2:25 to 2:30 A. M., when by the smaller instrument eight miles were registered, or at the rate of 96 miles an hour. The larger instrument registers

at ten-mile intervals, instead of one-mile intervals, and consequently an exact five-minute comparison cannot be made; but one ten-mile run was made in 6.45 minutes, which is at the rate of 93.3 miles per hour. Neither set of cups was blown off or in the least disabled by this wind. It was a result entirely unexpected by the writer, that the two anemometers should so closely correspond in their aggregate and maximum velocities. The period under discussion includes the three calmest months of the year, and consequently the smaller instrument has a slight advantage over the larger in total returns. It will probably be found, when we are able to include one entire year in the comparison, that the larger cups will have a very slight advantage over the smaller; but the difference between the total velocities of these instruments is so minute as hardly to be worthy of consideration.

MINERAL WATERS.

G. H. FAILYER AND C. M. BREESE,
Kansas State Agricultural College, Manhattan.

In reporting the results of the analyses of mineral waters made during the year, we have followed the recommendation of the committee appointed by the Chemical Section of the A. A. A. S., to report upon best methods of stating results*: that is, the basic elements are given as such, not as oxides, as was usual previously; the acidic elements are given as such, if directly combined with a basic element; if in the form of an oxygen acid, the whole of the oxygen of the salt is given in stating the amount of the acid. Instead of giving magnesium sulphate ($MgSO_4$) as MgO and SO_3, it is now given as Mg and SO_4. Chlorine is given, and not hydrochloric acid, the element chlorine being directly combined with the metal, as in NaCl.

The amounts are given in parts per thousand. The specific gravity of a water containing so little in solution is appreciably one, and these amounts may be taken as giving the grams per litre. Multiplied by 58.3 they will give approximately the grains per U. S. gallon. The results can thus be readily reduced to this form by those who so desire; but of the three forms, that of parts per thousand is the simplest statement of the strength of a solution. These are ratios that can be seen readily, while it requires more than ordinary familiarity with these units to enable one to perceive the relation of solids to the liquid in which they are found, when stated as grains per gallon.

No. 1 is from Burr Oak, Kansas.

No. 2 is from Conway, Kansas.

No. 1.	*Parts per 1000.*
Potassium	Trace.
Sodium	.3170
Lithium	.0008
Calcium (as bicarbonate)	.0038
Calcium (not as bicarbonate)	.4585
Magnesium (as bicarbonate)	.0015
Magnesium (not as bicarbonate)	.3733
Alumina	.1175
Iron (as bicarbonate)	.0144
Sulphuric acid (SO_4)	2.9407
Chlorine	.1051
Phosphoric acid	Trace.
Boric acid	Trace.
Silica	.0883

Combined and free carbonic acid not determined.

*See Proceedings American Association for the Advancement of Science, 1887, page 143.